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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/693,429	10/23/2003	J. Rodney Walton	030417	2025

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QUALCOMM INCORPORATED
5775 MOREHOUSE DR.
SAN DIEGO, CA 92121

EXAMINER	
SMITH, MARCUS	
ART UNIT	PAPER NUMBER
2419	

NOTIFICATION DATE	DELIVERY MODE
09/03/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

us-docketing@qualcomm.com
kascanla@qualcomm.com
nanm@qualcomm.com

Office Action Summary	Application No.	Applicant(s)	
	10/693,429	WALTON ET AL.	
	Examiner	Art Unit	
	MARCUS R. SMITH	2419	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5/01/09*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *35-41,43-56,58-68,70,71,73-82,84 and 85* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *35-41,43-56,58-68,70,71,73-82,84 and 85* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, filed 5/01/09, with respect to the rejection(s) of claim(s) 35-41, 43-56, 58-68, 70-71, 73-82, 84, and 85 under 35 U.S.C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Heath, Jr et al. (US 6,937,592), Heath (US 6,850,498) and Catreux (US 6,802,035).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 35-41, 43-48, 60-68, 70 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heath, Jr et al. (US 6,937,592) and Heath (US 6,850,498).

With regard to claim 35, 39, 61, 64, Heath Jr teaches (see figures6-8): A method of transmitting data in a wireless multiple-input multiple-output (MIMO) communication system (column 11, lines 50-65), comprising: coding and modulating a first plurality of data streams to obtain a first plurality of data symbol streams (see figure 2, column 6, lines 54-65 and column 14, lines 5-25)); spatially processing the first plurality of data symbol streams with a first plurality of steering vectors to obtain a first plurality of transmit symbol streams for transmission from a plurality of antennas (column 14, lines

25-50: The data can be transmitted to the user terminal by spatial multiplexing unit. See also step 716 discussed in column 13, lines 40-45); coding and modulating a second plurality of data streams to obtain a second plurality of data symbol streams (column 7, lines 35-67 and see claims 16-18 on column 17); and providing the second plurality of data symbol streams as a second plurality of transmit symbol streams in accordance to a non-steered spatial multiplexing mode for transmission from the plurality of antennas (column 14, lines 25-50: The data can be transmitted to the user terminal by non-spatial multiplexing unit. See also step 714 discussed in column 13, lines 35-45. The examiner views the non-spatial multiplexing mode as the non-steered spatial multiplexing mode.).

Heath Jr fails to disclose the first data stream going to a first user terminal in a first transmission interval and the second data stream going to a second user terminal in a second transmission interval.

However, Heath teaches a system where a transmitter can send coded and modulate data steams to more than two receivers, in which each stream can has a different transmission mode for each receivers (column 5, lines 40-65, see figures 1 and 2). Also, Heath teaches that any receiver can observed other transmission mode to determine which transmission mode has better quality and switch to that transmission mode (column 6, lines 5-40).

Since Heath teaches that the transmission mode can transmission diversity or spatial multiplexing (column 7, lines 1-15), it would have been obvious to one having ordinary skill in the art at the time invention was made to have the transmitter send a data stream to the first user using one transmission mode, and send another data

stream to the second user using another transmission mode as taught by Heath in system of Health Jr in order to improve the performance level of the wireless link and minimize error rate in the system (Health: column 2, lines 35-45).

With regard to claim 40, 48, 67, and 70, Heath Jr. teaches: An apparatus in a wireless multiple-input multiple-output (MIMO) communication system (column 11, lines 50-65), comprising: a receive spatial processor operative to perform receiver spatial processing on a first plurality of received symbol streams in accordance with a first spatial multiplexing mode to obtain a first plurality of recovered data symbol streams (spatial multiplexing receiver, 830: lines 25-45), and

perform receiver spatial processing on a second plurality of received symbol streams in accordance with a second spatial multiplexing mode to obtain a second plurality of recovered data symbol streams wherein the second spatial multiplexing mode is a non-steered spatial multiplexing mode (non-spatial multiplexing receiver, 832: column 14, lines 25-45); and a receive data processor operative to demodulate and decode the first plurality of recovered data symbol streams in accordance with a first plurality of rates to obtain a first plurality of decoded data streams (column 6, lines 54-65).

Heath Jr. fails to disclose the receiver demodulate and decode the second plurality of recovered data symbol streams in accordance with a second plurality of rates to obtain a second plurality of decoded data streams.

However, Heath teaches a system where a transmitter can send coded and modulate data steams to more than two receivers, in which each stream can has a

different transmission mode for each receivers (column 5, lines 40-65, see figures 1 and 2). Also, Heath teaches that any receiver can observed other transmission mode to determine which transmission mode has better quality and switch to that transmission mode (column 6, lines 5-40). In figure 2 of Heath, the receiver includes a receiver processor and frame decoder to demodulate and decode all the signals (column 7, lines 45-60).

Therefore, it would have been obvious to one having ordinary skill in the art at the time invention was made to have the receiver processor and frame decoder to demodulated and decode the first and second steams of data even though they have different transmission modes as taught by Heath in the system of Heath Jr. in order to improve the performance level of the wireless link and minimize error rate in the system.

With regard to claims 36, 62, 65, Heath Jr. also teaches: deriving the first plurality of steering vectors such that the first plurality of data streams are transmitted on a plurality of orthogonal spatial channels of a first MIMO channel for the first user terminal (column 15, lines 1-20).

With regard to claims 37, 63, and 66, also teaches: coding and modulating a third plurality of data streams to obtain a third plurality of data symbol streams (Heath : frame with Mode Z, figure 8, column 13, lines 1-20); and spatially processing the third plurality of data symbol streams with a second plurality of steering vectors to obtain a third plurality of transmit symbol streams for transmission from the plurality of antennas to a plurality of user terminals in a third transmission interval (Heath Jr. column 15, lines 1-20).

With regard to claim 38, also teaches: deriving the second plurality of steering vectors such that the third plurality of data streams are received with suppressed crosstalk at the plurality of user terminals (cancel interference: column 11, lines 1-15).

With regard to claims 41, 68, and 71, Heath Jr. also teaches: wherein the first spatial multiplexing mode is a steered spatial multiplexing mode (see figure B: column 7, lines 15-35), and wherein the first plurality of received symbol streams are spatially processed with a plurality of eigenvectors for a plurality of spatial channels of a MIMO channel for a user terminal (column 15, lines 1-25).

With regard to claim 43,, Heath Jr. also teaches: wherein the second plurality of decoded data streams are estimates of a plurality of data streams transmitted by a single user terminal (column 15, lines 50-67)

With regard to claim 44, Heath also teaches: wherein the second plurality of decoded data streams are estimates of a plurality of data streams transmitted simultaneously by a plurality of user terminals (figure 8, column 13, lines 1-20).

With regard to claims 45, Paulraj also teaches: wherein the second plurality of received symbol streams are spatially processed based on a channel correlation matrix inversion (CCMI) technique (column 8, lines 1-10).

With regard to claims 46, Heath Jr. also teaches: wherein the second plurality of received symbol streams are spatially processed based on a minimum mean square error (MMSE) technique (column 15, lines 22-37).

With regard to claim 47, Heath Jr. also teaches: wherein the second plurality of received symbol streams are spatially processed based on a successive interference cancellation (SIC) technique (column 15, lines 50-67).

4. Claims 49-59, 73-82, 84, and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heath Jr. in view of Catreux (US 6,802,035).

With regard to claim 49, 54, 55, 73, 77, Heath Jr. teaches (see figure 3):

A method of transmitting data in a wireless multiple-input multiple-output (MIMO) communication system (column 11, lines 50-60), comprising: receiving information indicating a spatial multiplexing mode (control channel indicating the preferred transmission mode) wherein the spatial multiplexing mode is selected from among a plurality of spatial multiplexing modes supported by the system, (column 8, lines 47-67 to column 9, lines 1-15), wherein the spatial multiplexing mode is a non-steered spatial multiplexing mode (figure 3C), coding and modulating a plurality of data streams and spatially processing the plurality of data symbol streams in accordance with the spatial multiplexing mode to obtain a plurality of transmit symbol streams for transmission from a plurality of antennas (column 7, lines 35-67)

However, Heath Jr. fails to disclose the receive information includes a plurality of rates use for data transmissions, wherein each of the plurality of rates is selected from among a set of rates supported by the system.

Catreux also teaches a MIMO system with feedback information as well (see figures 2-3). Catreux teaches how the transmit unit receives mode information and rate information through its feedback extractor (column 9, lines 1-15). The rate information

can associate with look up table which varies transmission mode depending PER (see figure 4). From the feedback information, the transmit unit is able to determine modulation and coding rate for each data stream (column 9, lines 25-35).

Therefore it would have been obvious to one having ordinary skill in the art at the time invention was made to have the transmit unit receive rate information as well as the mode information through its feedback extractor as taught by Catreux in the system of Heath Jr. in order to dynamically optimize a transmission mode in the wireless network (abstract). Catreux teaches how the transmission rate and mode has a direct correlation to the modulation and coding scheme (see table 1 in column 6).

With regard to claims 81 and 84, An apparatus of receiving data in a wireless multiple-input multiple-output (MIMO) communication system, comprising: means for receiving information indicating a spatial multiplexing mode (column 8, lines 48-67), wherein the spatial multiplexing mode is selected from among a plurality of spatial multiplexing modes supported by the system, (column 9, lines 1-15); wherein the spatial multiplexing mode is a non-steered spatial multiplexing mode (figure 3C), coding and modulating a plurality of data streams and spatially processing the plurality of data symbol streams in accordance with the spatial multiplexing mode to obtain a plurality of transmit symbol streams for transmission from a plurality of antennas (column 7, lines 35-67)

However, Heath Jr. fails to disclose the receive information includes a plurality of rates use for data transmissions, wherein each of the plurality of rates is selected from among a set of rates supported by the system.

Catreux also teaches a MIMO system with feedback information as well (see figures 2-3). Catreux teaches how the transmit unit receives mode information and rate information through its feedback extractor (column 9, lines 1-15). The rate information can associate with look up table which varies transmission mode depending PER (see figure 4). From the feedback information, the transmit unit is able to determine modulation and coding rate for each data stream (column 9, lines 25-35).

Therefore it would have been obvious to one having ordinary skill in the art at the time invention was made to receive rate information as well as the mode information as taught by Catreux in the system of Heath Jr. through its control channel in order to dynamically optimize a transmission mode in the wireless network (abstract). Catreux teaches how the transmission rate and mode has a direct correlation to the modulation and coding scheme (see table 1 in column 6).

With regard to claims 50, 56, 74, 78, 82, and 85, Heath Jr. also teaches: wherein the first spatial multiplexing mode is a steered spatial multiplexing mode (see figure B: column 7, lines 15-35), and wherein the first plurality of received symbol streams are spatially processed with a plurality of eigenvectors for a plurality of spatial channels of a MIMO channel for a user terminal (column 15, lines 1-25).

With regard to claim 51, Heath Jr. also teaches: transmitting a steered pilot (training tones) on each of the plurality of orthogonal spatial channels (column 9, lines 10-15)).

With regard to claims 52, 75, and 79, Heath Jr. also teaches: wherein the plurality of data symbol streams are provided as the plurality of transmit symbol streams (see figure 6, column 12, lines 40-67).

With regard to claims 53, 76, and 80, Heath Jr. also teaches: further comprising: performing calibration so that uplink channel response is reciprocal of downlink channel response (column 15, lines 22-30).

With regard to claim 58, see claims 46-47.

With regard to claim 59, Heath Jr. also teaches: wherein the second plurality of decoded data streams are estimates of a plurality of data streams transmitted by a single user terminal (column 15, lines 50-67)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARCUS R. SMITH whose telephone number is (571)270-1096. The examiner can normally be reached on Mon-Thurs: 7:30 am - 5:00 p.m. and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pankaj Kumar can be reached on 571 272-3011. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MRS 8/31/09
/Pankaj Kumar/
Supervisory Patent Examiner, Art Unit 2419